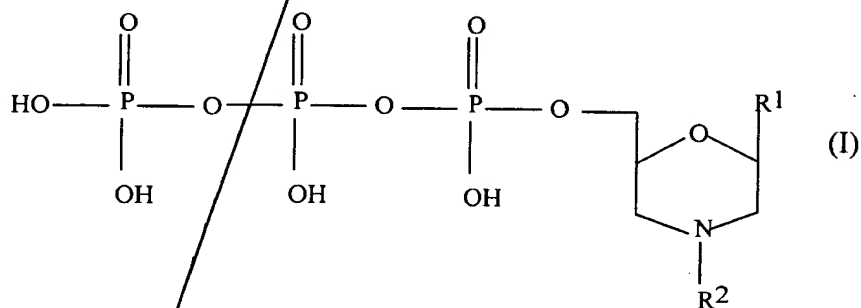
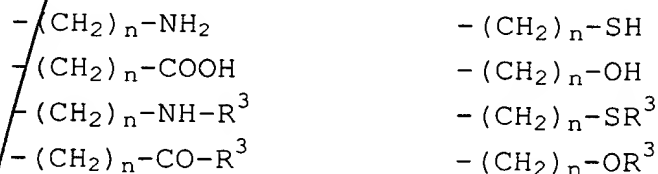


## CLAIMS

1. Process for manufacturing a 3'-labelled nucleic acid (DNA or RNA) fragment, which comprises the enzymatic incorporation of a nucleotide derivative having as precursor a compound of formula:



- in which  $\text{R}^1$  represents a nucleic base and  $\text{R}^2$  represents a group corresponding to one of the following formulae:



in which  $n$  is an integer ranging from 1 to 12 and  $\text{R}^3$  is a group derived from a label, a protein, an enzyme, a fatty acid or a peptide, at the 3' OH end of the nucleic acid fragment.

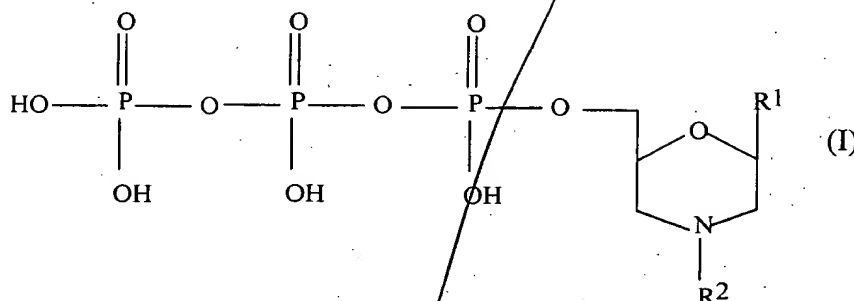
2. Process for modifying a nucleic acid fragment by enzymatic incorporation at the 3' end of a modified morpholino nucleotide having as precursor a compound corresponding to the formula:

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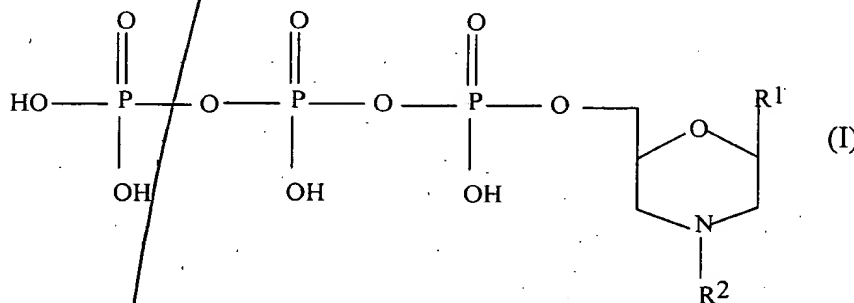


in which  $\text{R}^1$  represents a nucleic base and  $\text{R}^2$  represents a group corresponding to one of the following formulae:

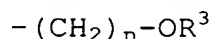
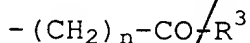
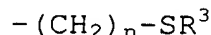
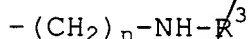
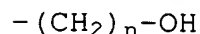
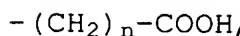
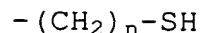
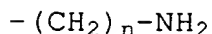
- $-(\text{CH}_2)_n-\text{NH}-\text{R}^3$
- $-(\text{CH}_2)_n-\text{CO}-\text{R}^3$
- $-(\text{CH}_2)_n-\text{SR}^3$
- $-(\text{CH}_2)_n-\text{OR}^3$

in which  $n$  is an integer ranging from 1 to 12 and  $\text{R}^3$  represents a compound chosen from photo-crosslinking agents, fatty acids, hydrophobic peptides, antibodies, enzymes and fluorophores.

3. Process for sequencing a nucleic acid (DNA or RNA) by the technique of enzymatic polymerization of the sequence complementary to this nucleic acid using chain terminators, in which at least one of the chain terminators has as precursor a compound corresponding to the formula:



in which  $\text{R}^1$  represents a nucleic base and  $\text{R}^2$  represents a group corresponding to one of the following formulae:



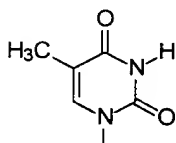
5 in which n is an integer ranging from 1 to 12 and R<sup>3</sup> is a group derived from a label, a protein, an enzyme, a fatty acid or a peptide.

10 4. Process according to Claim 1, 2 or 3, in which the enzyme is the Klenow fragment of DNA polymerase.

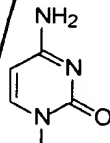
15 5. Process according to Claim 1, 2 or 3, in which the enzyme is a heat-resistant polymerase of a Thermophilus bacterium or terminal transferase or reverse transcriptase.

20 6. Process according to one of Claims 1 to 5, in which the nucleic base is a natural nucleic base chosen from adenine, guanine, cytosine, thymine, uracil, xanthine, hypoxanthine and 2-aminopurine, and derivatives thereof.

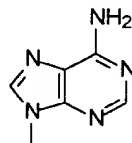
25 7. Process according to any one of Claims 1 to 5, in which R<sup>1</sup> corresponds to one of the following formulae:



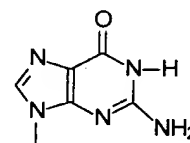
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30 8. Process according to one of Claims 1 to 7, in which the label is chosen from radioactive products, luminescent products, electroluminescent and

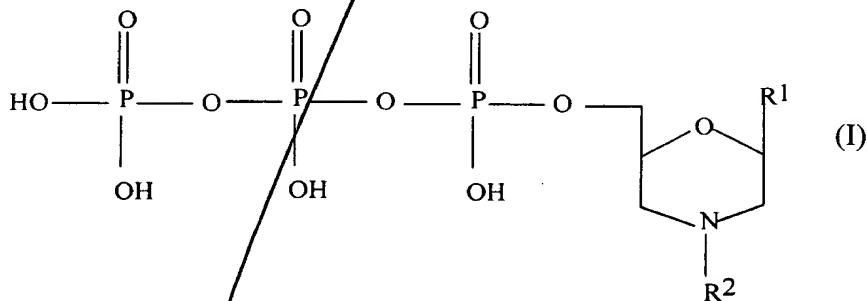
fluorescent products, molecules capable of coupling with other molecules, molecules which allow interactions of the antigen-antibody type, and enzymatic labels.

9. Process according to any one of the claims 1 to 7, in which  $R^3$  is a fluorophore.

10. Process according to Claim 9, in which  $R^3$  is chosen from fluorescein derivatives, biotin derivatives and rhodamine derivatives.

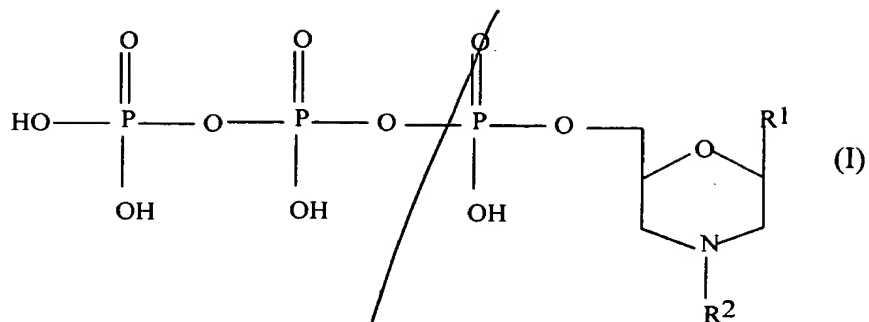
11. Process according to Claim 1, 2 or 3, in which the derivative, the modified morpholino-nucleotide or the chain terminator is compound (I) in monophosphate form.

12. Morpholino-nucleotide corresponding to the formula:



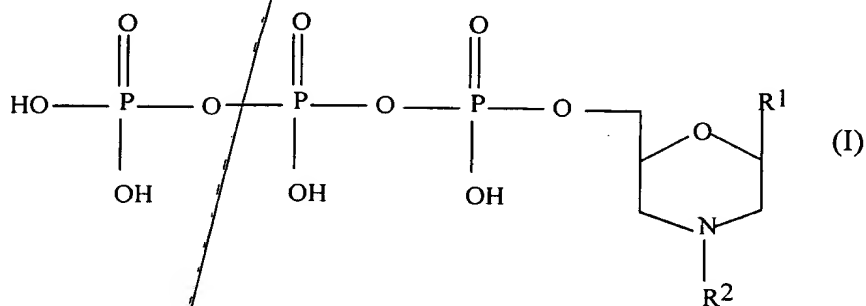
in which  $R^1$  is adenine and  $R^2$  represents  $-\text{CH}_2-\text{COOH}$ ,  $-(\text{CH}_2)_4-\text{NH}_2$  or  $-(\text{CH}_2)_4-\text{NH}-\text{R}^3$  with  $R^3$  representing a group derived from fluorescein.

13. Morpholino-nucleotide of formula:



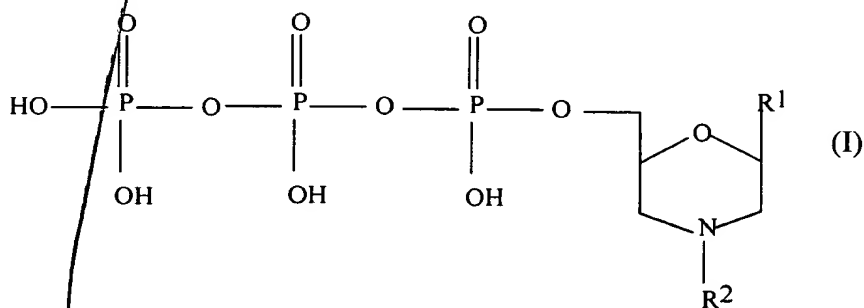
in which  $\text{R}^1$  is thymine and  $\text{R}^2$  represents  $-\text{CH}_2-\text{COOH}$ ,  $-(\text{CH}_2)_4-\text{NH}_2$  or  $-(\text{CH}_2)_4-\text{NH}-\text{R}^3$  with  $\text{R}^3$  representing a group  
5 derived from fluorescein.

14. Morpholino-nucleotide corresponding to the formula:



10 in which  $\text{R}^1$  is cytosine and  $\text{R}^2$  represents  $-\text{CH}_2-\text{COOH}$ ,  $-(\text{CH}_2)_4-\text{NH}_2$  or  $-(\text{CH}_2)_4-\text{NH}-\text{R}^3$  with  $\text{R}^3$  representing a group derived from fluorescein.

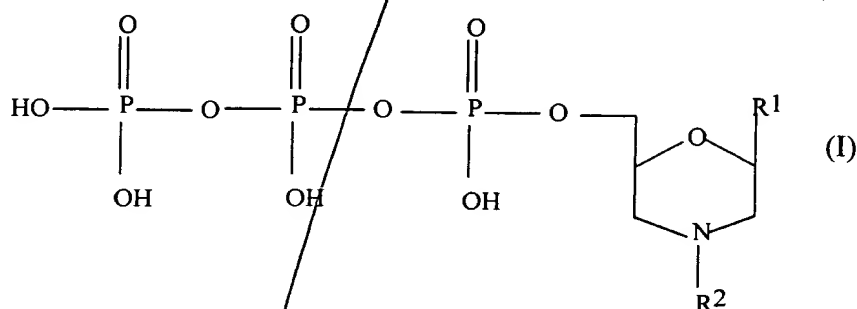
15 15. Morpholino-nucleotide corresponding to the formula:



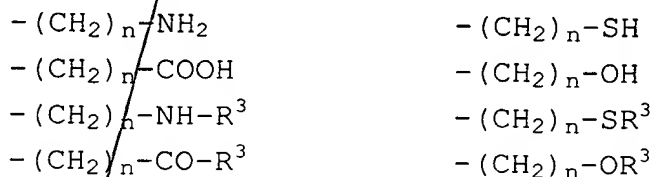
in which  $R^1$  is guanine and  $R^2$  represents  $-\text{CH}_2-\text{COOH}$ ,  $-(\text{CH}_2)_4-\text{NH}_2$  or  $-(\text{CH}_2)_4-\text{NH}-R^3$  with  $R^3$  representing a group derived from fluorescein.

5

16. Process for manufacturing a morpholino-nucleotide of formula:



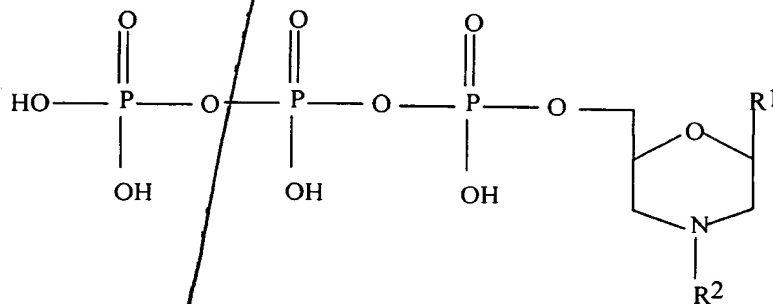
10 in which  $R^1$  represents a nucleic base and  $R^2$  represents a group corresponding to one of the following formulae:



15

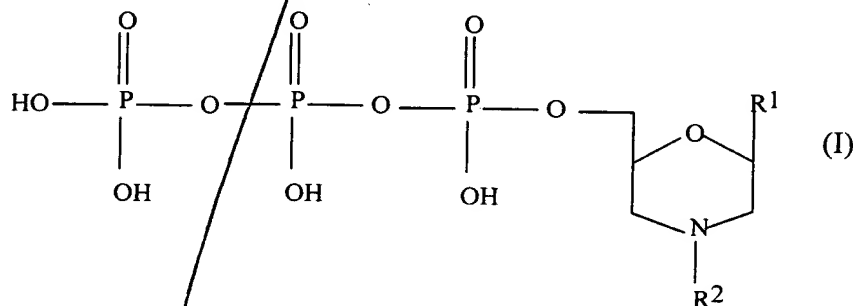
in which  $n$  is an integer ranging from 1 to 12 and  $R^3$  is a group derived from a label, from a protein, from an enzyme, from a fatty acid or from a peptide, the reaction of a nucleoside triphosphate of formula:

20



in which  $R^1$  has the meaning given above, with a periodate, a compound of formula  $R^2 NH_2$  in which  $R^2$  has the meaning given above, and sodium borohydride.

5 17. Use of a morpholino-nucleotide of formula:



in which  $R^1$  represents a nucleic base and  $R^2$  represents a group corresponding to one of the following formulae:

- |                    |                  |
|--------------------|------------------|
| $-(CH_2)_n-NH_2$   | $-(CH_2)_n-SH$   |
| $-(CH_2)_n-COOH$   | $-(CH_2)_n-OH$   |
| $-(CH_2)_n-NH-R^3$ | $-(CH_2)_n-SR^3$ |
| $-(CH_2)_n-CO-R^3$ | $-(CH_2)_n-OR^3$ |

15 in which  $n$  is an integer ranging from 1 to 12 and  $R^3$  is a group derived from a label, from a protein, from an enzyme, from a fatty acid or from a peptide, for the labelling of DNA or RNA fragments.

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